REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-2, 8-16 and 18-22 are presently active in this case. The present Amendment amends Claims 1-2, 8-10, 12-14, 16 and 18-19; cancels Claims 3-7 and 17 and adds new Claims 21-22 without introducing any new matter.

The outstanding Office Action objected to the Specification, Drawings and Claims 8, 13 and 18 because of informalities. The outstanding Office Action rejected Claims 1-11 under 35 U.S.C. §112, second paragraph, as incomplete. Claim 1 was rejected under 35 U.S.C. §102(b) as anticipated by Hino et al. (U.S. Patent No. 4,882,479, herein "Hino"). Claim 12 was rejected under 35 U.S.C. §102(b) as anticipated by Zoot et al. (U.S. Patent No. 3,679,307, herein "Zoot"). Claims 16-18 were rejected under 35 U.S.C. §102(a) as anticipated by Thorburn et al. (U.S. Publication No. 2003/0047673, herein "Thorburn"). Claims 2-6 and 9-11 were rejected under 35 U.S.C. §103(a) as unpatentable over Hino in view of Thorburn. Claims 13-15 were rejected under 35 U.S.C. §103(a) as unpatentable over Zoot in view of Thorburn. Claims 19-20 were rejected under 35 U.S.C. §103(a) as unpatentable over Thorburn.

Claims 7-8 were indicated as allowable if rewritten to overcome the rejection under 35 U.S.C. §112, second paragraph. Applicants acknowledge with appreciation the indication of allowable subject matter.

In response to the objections to the Title, the Title is amended to recite "OPTICAL ENCODER." The change to the title finds support in independent Claim 1 and therefore is not believed to raise a question of new matter.

In response to the objection to the Specification, the Specification is amended to correct the informalities noted in the outstanding Office Action. In light of their formal nature, the changes are not believed to raise a question of new matter.

In response to the objection to Claims 8, 13 and 18, Claims 13 and 18 are amended to recite "a same common wiring." This change finds support in original Claim 5. Further, the space in Claim 8 is deleted.

In response to the objection to the Drawings, submitted herewith is a Letter Submitting Drawing Sheets along with 3 Replacement Sheets for Figures 11-13 adding the appropriate legends and labels. In particular, Figures 11-13 are labeled "background art" and the reference numeral "31" of Figure 13 is changed to "32" for consistency with the Specification.

In response to the rejection under 35 U.S.C. §112, second paragraph, the feature regarding a pitch smaller than a predetermined value is deleted from independent Claim 1. In view of amended Claim 1, it is believed that all pending claims are definite and no further rejection on that basis is anticipated. If, however, the Examiner disagrees, the Examiner is invited to telephone the undersigned who will be happy to work with the Examiner in a joint effort to derive mutually acceptable language.

Claims 1-2, 8-10, 12-14, 16 and 18-19 are amended to clarify the claimed subject matter. More particularly, independent Claim 1 is amended to recite "the first optical detector including a plurality of first photodiodes arranged along the first direction," to recite "the second optical detector including a plurality of second photodiodes arranged along the first direction, each of the second photodiodes being provided between the first photodiodes, and a wiring commonly connecting the plurality of second photodiodes," and to correct minor formalities. These features find non-limiting support in the disclosure as originally filed, for example in original Claims 2 and 5. Independent Claim 12 is amended to recite "a plurality of second photodiodes arranged along the first direction, each of the second photodiodes being provided between the first photodiodes" and to recite "a wiring commonly connecting the plurality of second photodiodes" and to correct minor formalities. These features find non-limiting support in the disclosure as originally filed, for example at page 13, lines 7-27

and in corresponding Figure 7. Independent Claim 16 is amended to recite "and arranged along the first direction" and to correct minor formalities. These features find also non-limiting support in the disclosure as originally filed, for example at page 13, lines 7-27 and in corresponding Figure 7. Dependent Claims 2, 8-10, 13-14 and 18-19 are amended to correct minor formalities.

In order to vary the scope of protection recited in the claims, new Claims 21-22 are added. New Claims 21-22 recite features regarding the first and second photodiode and depend upon Claims 12 and 16, respectively. They find non-limiting support in the disclosure as originally filed, for example in original Claim 8. Therefore, the new claims are not believed to raise a question of new matter.[1]

In response to the rejection of Claim 1 under 35 U.S.C. §102(b) as anticipated by Hino, Applicants respectfully request reconsideration of this rejection and traverse the rejection, as discussed next.

Briefly recapitulating, Applicants' invention, as recited in Claim 1, relates to an optical encoder including: a first optical detector whose output is configured to change with a movement along a first direction of a series of light and dark patterns, the first optical detector including a plurality of first photodiodes arranged along the first direction; a second optical detector whose output is constant with the movement along the first direction of the series of light and dark patterns, the second optical detector including a plurality of second photodiodes arranged along the first direction, each of the second photodiodes being provided between the first photodiodes; a wiring commonly connecting the plurality of second photodiodes; and a circuit configured to perform a calculation based on the outputs of the first and second optical detectors. Independent Claims 12 and 16 disclose similar features and relate to an optical encoder including, *inter alia*, a plurality of first photodiodes and a

[1] See MPEP 2163.06 stating that "information contained in any one of the specification, claims or drawings of the application as filed may be added to any other part of the application without introducing new matter."

plurality of second photodiodes commonly connected to a same wiring, each of the second photodiodes being arranged between the first photodiodes. As explained in Applicants' Specification at page 7, lines 14-34 with corresponding Figure 1, Applicants' invention improves upon conventional optical encoders because DC components of photoelectric currents in the photodiodes can be cancelled. The claimed invention thus leads to improved dynamic range of the optical encoder.[2]

Turning now to the applied references, Hino discloses an optical rotary encoder, using a laser light that irradiates a rotating element with a light scattering plane, wherein the laser light is scattered and split into components.[3] However, Hino fails to teach a plurality of first photodiodes and a plurality of second photodiodes, the plurality of second photodiodes are commonly connected to a same wiring, and also fails to teach or suggest that each of the second photodiodes being arranged between the first photodiodes. Hino explicitly teaches a laser device that emits laser light to first and second detectors 5 and 8, through either a beam splitter 10 or a transparent disk 3a.[4] First and second laser light detectors 5 and 8 arranged to receive laser light from different optical paths, as disclosed by Hino, ***are not*** a plurality of second photodiodes arranged between a plurality of first photodiodes, as claimed by Applicants' Claim 1.

For at least the above stated reason, the applied reference fails to teach or suggest every feature recited in Applicants' claims, so that independent Claim 1 is patentably distinct over the applied reference. Accordingly, Applicants respectfully traverse, and request reconsideration of, the rejection based Hino.[5]

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[2] See Applicants' Specification from page 3, line 30 to page 4, line 13.
[3] See Hino in the Abstract, from column 1, line 61 to column 2, line 20 and in corresponding Figure 1.
[4] See Hino in the Abstract, from column 3, line 40 to column 4, line 21 and in corresponding Figure 1.
[5] See MPEP 2131: "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference," (Citations omitted) (emphasis added). See also MPEP 2143.03: "All words in a claim must be considered in judging the patentability of that claim against the prior art."

In response to the rejection of Claim 12 under 35 U.S.C. §102(b) as anticipated by Zoot, Applicants respectfully request reconsideration of this rejection and traverse the rejection. Zoot discloses a distance measurement device, wherein a photodetector 38 may comprise large size photoconducting films 47, 48 and small size photoconducting films 49, 50.[6] Further Zoot teaches that suitable conducting leads 52 provide electrical connections to each of the individual films 47-50.[7] Multiple conducting leads to connect each of the individual films, as disclosed by Zoot, ***is not*** a plurality of second photodiodes commonly connected to a same wiring, as claimed by Applicants' Claim 12.

For at least the above stated reason, the applied reference Zoot fails to teach or suggest every feature recited in Applicants' claims, so that independent Claim 12 is patentably distinct over the applied reference. Accordingly, Applicants respectfully traverse, and request reconsideration of, the rejection based Zoot.

In response to the rejection of Claims 16-18 under 35 U.S.C. §102(a) as anticipated by Thorburn, Applicants respectfully request reconsideration of this rejection and traverse the rejection. Thorburn discloses an optical detector array, wherein four groups of photodetectors D_0, D_1, D_2, and D_3 are arranged at 0, 90, 180 and 270 degrees towards each other, in relationship with a period T of a signal.[8] Thorburn further discloses that the output terminals of all photodetectors D_0, D_1, D_2, and D_3 are electrically connected.[9] Four groups of photodetectors D_0, D_1, D_2, and D_3 electrically connected with each other, as disclosed by Thorburn, ***is not*** a plurality of first photodiodes arranged in a first direction; a plurality of second photodiodes commonly connected to a same wiring and arranged along the first direction, each of the second photodiodes arranged between the first photodiodes, as claimed by Applicants' Claim 16.

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[6] See Zoot in the Abstract, at column 5, lines 48-60 and in corresponding Figure 4.
[7] See Zoot at column 5, lines 56-58.
[8] See Thorburn in the Abstract, at page 4, paragraph 45 and in corresponding Figure 4.
[9] See Thorburn at page 4, paragraph 42.

Accordingly, the applied reference Thorburn fails to teach or suggest every feature recited in Applicants' claims, so that independent Claim 16 is patentably distinct over the applied reference. Accordingly, Applicants respectfully traverse, and request reconsideration of, the rejection based Thorburn.

In response to the 35 U.S.C. §103(a) rejection of Claims 2-6, 9-11, 13-15 and 19-20, since the independent claims are believed to be allowable, the dependent claims are also believed to be allowable. Further, the combination of Hino and Thorburn or Zoot and Thorburn, even if assumed to be proper, does not remedy the deficiencies of the primary references of Hino and/or Zoot. Accordingly, Applicants respectfully request reconsideration of the obviousness-type rejections.

Consequently, in view of the present Amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 1-2, 8-16 and 18-22 is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact Applicants' undersigned representative at the below listed telephone number.

Respectfully submitted,

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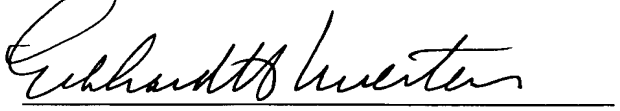
MAIER & NEUSTADT, P.C.



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